

## CH 101B : ENGINEERING CHEMISTRY

L	T	P	Credits	Sessional Marks: 25	
3	01	-	04	Theory Marks: 75	
				Duration of Exams: 3 Hours	

### OBJECTIVES:

1. To understand the principles associated with thermodynamics and their applications.
2. To study the phase equilibria in one component and two component systems.
3. To study the mechanism of corrosion, protective methods and Lubricants & their uses.
4. To study polymerization process, composites and their applications.
5. Study of various instrumental techniques used in chemistry.

### OUTCOME:

1. Able to apply the law of thermodynamics and phase equilibria for various systems.
2. Able to develop innovative methods to produce soft water.
3. Able to apply the techniques for protection of corrosion
4. Able to select specific lubricants to reduce wear and tear in various situations.
5. Gain the knowledge of various class of polymers and composites along with their application
6. Able to understand, explain and select instrumental techniques for analysis.

### Books :

1. Physical Chemistry, P.W. Atkins (ELBS, Oxford Press).
2. Physical Chemistry, W.J. Moore (Orient-Longman).
3. Instrumental methods of Chemical Analysis, MERITT & WILLARD (East-West Press).
4. Chemistry in Engineering & Tech., Vol.I& II, Rajaram, Kuriacose (TMH)
5. Engineering Chemistry ,ShashiChawla (DhanpatRai and co.)
6. Engineering Chemistry, P.C. Jain, Monica Jain (DhanpatRai& Co.).
7. Engeneering chemistry ,S.S Dara (S.chand&co.)

### LECTUREWISE PROGRAMME : (from 08.01.18 to 27.04.18)

Introduction of the subject

08.01.18

#### UNIT-I

**Thermodynamics** –Second law, concept of entropy ,entropy change for ideal gas, free energy and work functions, free energy change ,chemical potential, Gibb's Helmholtz equation, Clausius –Clapeyron equation. Related numerical problems with above topics.

**Phase-rule-** Terminology, Derivation of Gibb's Phase Rule equation ,One component system(water system), Two components systems, system with Eutectic point (Pb-Ag), system with congruent melting point (Zn-Mg), system with incongruent melting point (Na-K), Applications of above systems. Elementary idea of Zone refining and Zone levelling

09.01.2018-30.01.2018

#### UNIT-II

**Water and its treatment-** Hardness of water and its determination, units of hardness, alkalinity of water and its determination, related numerical problems ,water softening, Ion-exchange process, mixed bed demineralisation, desalination of water by using different methods.

**Corrosion and its prevention:** Galvanic & concentration cell, dry and wet corrosion, Electrochemical theory of corrosion, Galvanic corrosion, Pitting corrosion , differential aeration corrosion, water line corrosion, stress corrosion, factor effecting corrosion, Preventing measures, electroless Plating of Ni and Cu.

02.02.2018-28.02.2018

### UNIT-III

**Polymers and Polymerization:** Organic polymers, polymerisation, various types of polymerisation, effect of structure on properties of polymers, preparation properties and technical applications of thermoplastics (PE, PVC, PVA, Teflon), thermosets (PF, UF & MF) and elastomers (Synthetic Rubber including SBR, Buna-S, Buna-N, Thiokol & Polyurethanes), Inorganic polymers (general properties) , Glass transition temperature, silicones

**Composite Materials & their application:** optical fibres, Fullerenes ,organic electronic material ,composite materials & their classification, constituents of composites, role of interface in composite performance and durability, fiber –Reinforced composite, advantage and applications of composites.

01.03.2018-28.03.2018

### UNIT-IV

**Lubricants and fuels:** Friction, mechanism of lubrication, classification and properties of lubricants and selection of Lubricants, Definition and classification of fuel, Calorific value and methods of its determination.

**Analytical methods:** Thermal methods; Principle, method and application of TGA,DTA & DSC, interaction of E.M radiation with a molecule and origin of spectrum, Vibrational & electronic spectra (Experimental details are excluded), spectrophotometry, , conductometric titrations, elementary discussion on Flame- photometry.

02.04.2018-28.04.2018

**Note:** The aforesaid syllabus will be taught by two faculty members simultaneously.

### Evaluation Procedure

1.	Surprise Quiz/ Tutorial Test	5 Marks
2.	Assignment	5 Marks
3.	Minor Tests (Two tests having equal weightage) Minor Test I : 14-16 Feb, 2018 Minor Test II : 4 -6 April, 2018	15 Marks
4.	University Examination	75 Marks

Award of Grades Based on Absolute Marks: The University is following the system of grading based on absolute marks (after applying moderation if any). Following grading will be done based on the % of marks obtained in all the components of evaluation part of the subject.

A+ (90% - 100 %), A (80% - 89%), B+ (70% - 79%) , B(62% - 69%), C+ (55% - 61%), C (46% - 54%), D (40% - 45), F (Less than 40 %)

For F grade, a candidate shallbe required to appear in the major test of concerned course only in the subsequent examination(s) to obtain the requisite marks/grade.

**Attendance Record** – Candidate should attend at least75% attendance of the total classes held of the subject

**Chamber consultation hour:** Any vacant period.

### Note:

1. In the semester examination, the examiner will set 09 questions in all. Question No 1 will be compulsory, there will be two questions each for units I to IV, out of which the student will be required to select one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

## CH 618B REACTIONS AND REAGENTS

L	T	P	Credits	Sessional Marks:	50
4	-	-	04	Theory Marks:	100
				Duration of Exams:	3 Hours

### OBJECTIVES:

1. To review the fundamental concepts of organic chemistry and their applications.
2. To get familiarized with various types of organic reactions.
3. To study various reagents, their classification and uses in organic chemistry.
4. To study the actual series of discreet steps involved in transformation of reactants into products.
5. To study the molecular rearrangements involving reshuffling of sequence of atoms to form a new structure

### OUTCOME:

1. Able to have a firm foundation and application of fundamental concept of organic chemistry.
2. Able to identify the reaction type depending upon the reactant and conditions.
3. Able to predict the role of various reagents in organic chemistry.
4. Able to propose a suitable mechanism for a given transformation.
5. Able to identify the reactivity and stability of organic molecules based on structure and stereochemistry
6. Able to explain the conversion of different functional groups via rearrangement.

### Books :

1. Advanced Organic Chemistry, Reactions Mechanisms and Structure, J. March, John Wiley.
2. Modern Synthetic Reactions, H.O. House, W.A. Benjamin.
3. Some Modern Methods of Organic Synthesis, W. Carruthers, Foundation Books.
4. Principles of Organic Synthesis, R.O.C. Norman and J.M. Coxon, Blackie Academic & Professional.
5. Reagents in Organic Synthesis, Fieser and Fieser, Wiley.
6. Reactions, Rearrangements & Reagents by Sanyal from Bharti Bhawan.
7. Reaction & Rearrangements by O P Agrawal, Goel Publication
8. Organic reaction mechanism, V K Ahluwalia
9. Name Reactions and Reagents in Organic Synthesis by Bradford P. Mundy, Michael G. Ellerd and Frank G. Favaloro Jr. from Wiley
- 10.
- 11.

### LECTUREWISE PROGRAMME : (from 08.01.18 to 27.04.18)

Introduction of the subject:

**08.01.2018**

#### UNIT - I

Preparation, properties and applications of following reagents in organic synthesis with mechanistic details: -

**Organometallic Reagents:** n-Butyllithium, Grignard reagent, Organo chromium(III) compounds, Dialkyl copper lithium, Pentacarbonyl iron, Tetracarbonyl nickel, octacarbonyl dicobalt, Alkene Palladium (II) complexes, Wilkinsons catalyst, Tri-n-butyl tin hydride, Trimethyl silyl iodide, Diborane.

**09.01.2018-15.03.2018 (15 Hrs)**

#### UNIT - IV

**Rearrangements:** General mechanistic considerations – nature of migration, migratory aptitude, A detailed study of following rearrangements. Pinacol – pinacolone, Wagner-Meerwein, Demjanov, Benzil-Benzilic acid, Favorskii, Arndt-Eistert synthesis, Neber, Beckmann, Hofman, Curtius, Schmidt, Baeyer-Villiger Shapiro reaction.

**09.01.2018-15.03.2018**

## UNIT - II

**General Reagents:** DCC, 1,3-dithianes, Polyphosphoric acid, diazomethane, Boron Trifluoride, Trifluoro acetic acid, cuprous chloride, N-bromosuccinamide, Phase Transfer catalysts.

**16.03.2018-27.04.2018**

## UNIT - III

**Oxidation:** Leadtetraacetate, osmium tetroxide, selenium dioxide, potassium permanganate, Fenton's reagent, ozone, perbenzoic acid, periodic acid, chromium oxide, DDQ.

**Reduction:** Catalytic hydrogenation, lithium aluminium hydride, sodium borohydride, sodamide, zinc dust, sodium liquid ammonia, DIBAL, 9-BBN.

**16.03.2018-27.04.2018**

Note: The aforesaid syllabus will be taught by two faculty members simultaneously.

### Evaluation Procedure

1.	Home assignment	10 Marks
2.	Minor Tests (Two tests having equal weightage)	
	Minor Test I : 14-16 Feb, 2018	20 Marks
	Minor Test II : 4 -6 April, 2018	20 Marks
3	University Examination	100 Marks

**Award of Grades Based on Absolute Marks:** The University is following the system of grading based on absolute marks (after applying moderation if any). Following grading will be done based on the % of marks obtained in all the components of evaluation part of the subject.

A+ (90% - 100 %), A (80% - 89%), B+ (70% - 79%), B(62% - 69%), C+ (55% - 61%), C (46% - 54%), D (40% - 45), F (Less than 40 %)

For F grade, a candidate shall be required to appear in the major test of concerned course only in the subsequent examination(s) to obtain the requisite marks/grade.

**Attendance Record** – Candidate should attend at least 75% attendance of the total classes held of the subject

**Chamber consultation hour:** Any vacant period.

### Note:

1. In the semester examination, the examiner will set 08 questions in all selecting two from each unit (1 & 2 from unit I, 3 & 4 from unit II, 5 & 6 from unit III and 7 & 8 from unit IV). The students will be required to attempt only 5 questions selecting at least one question from each unit. All questions will carry equal marks.